LONG-TERM DYNAMICS OF AIR POLLUTION BY SOME ISOTOPES OF TRANSURANIUM ELEMENTS IN BELARUS AFTER THE CHERNOBYL CATASTROPHE

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The disaster at the Chernobyl Nuclear Power Plant (ChNPP) and earlier nuclear weapon tests have led to the appearance of previously absent transuranium elements (TUE) in the environment. The Chernobyl emissions are characterized by higher relative content of plutonium isotopes with atomic mass of 238, 240 and 241. High content of ^{241}Pu leads to an increase in ^{241}Am content.

The study on radioactive atmosphere pollution with TUE in the Republic of Belarus has been conducted since 1980-th till now. Before the Chernobyl disaster (April 1986) the specific activity of radionuclides in the near ground air was: ^{239,240}Pu - 3.2×10^{-9} Bq/m^3, ^{238}Pu - 0.10×10^{-9} Bq/m^3. Right after the Chernobyl disaster a significant increase in the content of radionuclides (approximately in 10^6 times) was registered. After a sharp decrease in the specific activity of air in may-august 1986 the phase of a gradual self-purification of the near ground air from radionuclides has started (in the early years after the accident the half-life period of plutonium-239,-240 in atmosphere was 14.2 months).

Nowadays, radioactive air pollution is formed under the influence of the processes of resuspension and secondary transport of radioactive particles that depend on various factors of natural and anthropogenic origin. In the course of time a decrease in radionuclide concentration in the near ground air layer occurs due to migration through soil profile, accumulation by plants, and sorption on the surface of soil particles. Thus, redistribution and immobilization of radionuclides in various components of the biosphere occur that lead to a decrease in possibility of their transition to the air. The exceptions are those years in which there were numerous fires in the strongly contaminated areas (1992, 2002).

Linear dependence between activities of radionuclides in soil and air is typical for the “resettlement zone”. The pollution of surface soil layer (0-5 cm) with technogeneous radionuclides decreases significantly with the increase of distance from ChNPP. This leads to a decrease in the concentration of radioactive substances in the air. Nowadays, specific activity of plutonium isotopes in the near ground air layer in the south of Belarus is $1.1\text{-}2.3\times10^{-7}$ Bq/m^3, on the territories adjacent immediately to the exclusion zone (Bragin) – $2.2\text{-}4.7\times10^{-8}$ Bq/m^3, at a distance of 100 km (Gomel) does not exceed $1.0\text{-}4.3\times10^{-9}$ Bq/m^3.

Cycling changes in the content of technogeneous radionuclides in the near ground air with significant increase in spring-autumn period are observed in the course of a year. It is connected with the release of soil surface from snow in spring and vegetation in autumn, as well as with an intensive agricultural activity in areas adjacent to the “resettlement zone”.

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